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Introduction

Organizations generally make use of two kinds of knowledge: formal and informal. The two can be distinguished based on the extent of documentation. Formal knowledge is usually contained in books and manuals. On the other hand, informal knowledge could include assumptions, ideas, and viewpoints. From an organizational perspective, it also includes the culture, the shared beliefs, the core values, and very often past experiences or contexts in which decisions were made. Examples of informal knowledge can be seen in answering questions like: "Why did we do it that way?"; "What happened the last time we tried this approach?"; "Who would I go to solve this problem?"; "How are things done around here?"; and so on. Anand et al., (1998) refer to this as "soft knowledge" or knowledge that cannot be easily communicated. This includes tacit knowledge, belief structures, intuition, and judgmental abilities. The label of organizational memory collectively describes both formal and informal knowledge primitives. Stein and Zwass (1995) define organizational memory as "the means by which knowledge from the past is brought to bear on present activities, thus resulting in higher or lower levels of organizational effectiveness".

Organizational Memory Systems

Those systems that have been designed to store such informal knowledge are being referred to as organizational memory systems (OMS). The informal part of organizational memory, if captured and used can be a tremendous organizational asset. Jennex (1996) suggests that users of OMS "will have higher precision and recall rates than those who use only their own memories and paper documents". While there is no evidence yet of the above, it is clear that there is potential for such systems. OMS can enable a group to share a common schema or conceptualization attained by prior experiences with a new individual. Given the problem of personnel turnover, the OMS may be particularly useful in creating a virtual reality based training system for new employees. This problem could be acute in knowledge intensive firms (such as auditing firms) which have a large percentage of knowledge workers or specialists (Starbuck, 1992). Anand et al. (1998) provide an example of "If only you had asked us …" or "If only we had known …" syndrome where informal knowledge exists but cannot be tapped into for various reasons. In addition to their formal divisions, managers also typically belong to informal groups where they share and exchange notes, core values, and beliefs about their function. As a result, sometimes, with employee turnover, organizations also lose their informal knowledge bases.

Obstacles to the Design of Organizational Memory Systems

While there has been a good deal of research on the need for and various aspects and limitations of an Organizational Memory System(OMS) very little in the development of an operational OMS has been reported

In today's litegatious society it might appear that the capture, organization and ability to easily disseminate organizational memory might be harmful to the corporate entity. In fact, it has been proposed that corporations retain no corporate memory in the form of old memos, emails or status reports as this information may be used, perhaps out of context, to harm the corporation.

A significant barrier to the successful creation and use of OMS might be that there is no clear estimate of how long the development effort might take. With no clear short-term benefits in sight, organizations are less inclined to expend valuable organizational resources.

In addition to such a lack of commitment, there are also difficulties in the acquisition of such knowledge. While informal knowledge exists everywhere, it is by no means easily accessible. The difficulty in capturing informal knowledge may partially stem from evidence that such knowledge primitives frequently reside in hard to capture procedural memory (Cohen and Bacdayan, 1994). Unlike declarative memory, which stores facts and propositions, procedural memory stores processes and actions. Organizational learning which is the product of individual (or employee) learning results in individual procedural memories developing in the form of chunks. Successful usage reinforces the chunked rules. This is similar to the chunking of production rule knowledge described in the SOAR model of cognition (Laird et al., 1983). However the problem with capturing chunked organizational rules is that some of the individual rules

which form it may have decayed or may not be applicable in the current context. Thus, it is not just important to capture the memory but also to evolve and update it.

Prior organizational experience when applied in the right context can be useful but if applied in an inappropriate context will risk failure. Since organizational memory can reflect conflicts between organizational sub units (Levitt and March, 1988), the OMS would then also have to have a conflict resolution mechanism to decide which rules can be dissipated. If not, the organization must then have a conflict resolution policy.

Notwithstanding the problem of acquiring knowledge from an individual, a group can complicate the process because of multiple perspectives. Further, individuals who possess informal knowledge acquired through experience might be unwilling to share it as they might lose a perceived competitive advantage. In other words, there might be resistance due to the perceived fear of a shift in power status, and this could impede the transfer of informal knowledge.

Beyond the knowledge acquisition process, there is the problem of representation, maintenance, and finally the ability to effectively mine this database of informal knowledge. From a systems integration perspective, there is the issue of how to maintain the interaction between the more conventional transaction processing and decision support systems to the informal knowledge primitives found in OMS. It also makes sense to associate various data elements with informal knowledge primitives such as the decision-making context in which they were used.

The problem faced in building an OMS is not a scarcity of documents and artifacts for the organizational memory, but rather the quality, content, and organization of this material.

An Experimental OMS Architecture

In an attempt to explore OMS, we are proposing a limited OMS architecture. The OMS must provide a means to input organizational memory, a method for storage, indexing, classifying, extracting higher level concepts and an intelligent method for extracting and formatting it as needed.

In today's technical environment, it appears that the use of a corporate Intranet provides the most promising delivery system to integrate various products and to provide access to a corporate OMS.

Input

One of the problems in acquiring organizational memory artifacts is the additional burden placed on the personnel involved in the entry of the OM. This proposal utilizes the tools that are currently part of most corporate environments and commonly available to the personnel involved.

The system should support multiple forms of input. One should be the current and ongoing document repositories. The documents can be processed by an AI based classifier to organize them by word indexing and extrapolating the context of the document. This information would be made available to the search engine to allow retrieval.

The use of email or web based forms to report project status and issues is suggested. These forms will indicate and define the problem or issue and state if it is a subset of or related to a larger problem, identify personnel involved and the detail the potential and actual solutions to the problem or issue. Each problem or issue will have a post-mortem conducted reporting the results of implementing the action. This should help address the questions of " what did we do last time" and " who was involved".

In today's world a document is no longer a textual artifact, but can contain graphics, animation, sound and voice annotation. HTML provides a common standard for all document content formatting. All document artifacts are not created via email or a standard word processor. Since we are interested in storing, indexing, retrieving and displaying primarily document-based information, HTML should be adopted as the document standard.

In addition to electronic - standardized project status reporting and issue forms, we propose the use of scenario forms to capture strategic as well as current tactical issues being faced, intended outcomes and direction, potential solutions explored, the selected approach and the outcome of following the selected approach.

To complement tracking issues and status, the response to the issue and the effectiveness of the solution, the personnel involved are identified. This will assist in developing a personnel skills database to help identify personnel with unique skills and experiences. This information can be used to required skills to help address current problems of a similar.

Storage

Storage and organization of the documents captured is aided by a search engine that included not only word indexing but also AI components such as a classifier, GA or neural network component to help identify related documents. Development of this search engine is one of the major components of this proposal. All documents will be word indexed and the AI component will add to the richness of the data by identifying the context and

adding another level of association by which the artifacts stored in the corporate memory might be accessed. For the artifacts of previous issues to be truly useful in solving current problems, the must be easily accessible when required.

A project is the best method of identification and classification of a specific instance of an issue or problem. As similar reports accumulate or important problem domains are identified, the material is indexed and possibly re-coded in the form of a domain. A problem domain would contain a higher level of abstraction of the issues and actions used to address them. This information would be constructed in such a manner that hyperlinks would point to the lower level detail information to allow easier access to this information.

Part of the issue in storage and management is the pruning of aging or inappropriate information. This could be accomplished by reviewing the domain level information for conflicts and the development of rules to manage these conflicts. Management of conflicts could be to tag certain project information or issue information as obsolete. The maintenance of consistency has the potential to be the most vexing problem to solve. Some issues that complicate this process is the potential for differences between work groups.

User Interface

The output section of this architecture will utilize a web browser to provide a user-friendly interface to the search engine as well as an intelligent assistant to enhance the user's capabilities for searching and interpreting the information extracted. This interface will also include an AI component that will help the end user formulate queries and expand or prune the results obtained from the search as well as to assist in determining the context of the information being retrieved.

Over time we feel that this free form knowledge base will prove quite valuable to the corporation with little additional demands on the current personnel performing the tasks.

Conclusions

More research needs to be done to explore the potential of tools such as network analysis as well as some of the tools used in earlier studies in qualitative sociology. Techniques and tools based on social science and artificial intelligence paradigms such as network analysis (Stein, 1992), semantic networks (Chorafas, 1992), and ethnographs (Seidel and Clark, 1984) have been successfully used in the analysis of expert knowledge and appear to hold promise for the acquisition and representation effort in OMS. Many of these earlier tools can be updated using modern artificial intelligence techniques based on neural networks or genetic algorithms to extract and classify informal knowledge. The form and function of informal knowledge primitives may vary from one domain such as software engineering to other domains such as auditing. This in turn would affect the design and development of the OMS. A distributed interface should be designed on corporate Intranets so those organizational actors can effectively mine the OMS. Finally, the OMS should be integrated into the family of other organizational systems for transaction processing and decision support.

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